TITLE OF THE INVENTION

REFRIGERATOR WITH ICE FEEDING UNIT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Patent Application No. 2003-4130, filed on January 21, 2003 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates, in general, to a refrigerator with an ice feeding unit and, more particularly, to a refrigerator with an ice feeding unit which reduces operating noise of the ice feeding unit.

2. Description of the Related Art

[0003] A large-capacity conventional refrigerator includes an ice making unit to make ice cubes, and an ice container to hold the ice cubes made in the ice making unit. The refrigerator has, at a door thereof, an ice discharging path and an ice dispensing unit to allow a user to take the ice cubes from the ice container without opening the door. Further, an ice feeding unit is provided at a predetermined position in a cooling compartment of the refrigerator so as to feed the ice cubes from the ice container to the ice discharging path.

[0004] As shown in FIG. 1, the ice feeding unit of the conventional refrigerator includes a coiled feeding shaft 2 which is installed in an ice container 1 to feed ice cubes, a guide cylinder 3 which guides the ice cubes, a spiral blade 4 which is provided in the guide cylinder 3 to push the ice cubes, and an ice crusher 5 which crushes the ice cubes guided by the spiral blade 4.

[0005] The ice feeding unit also has a drive motor 6 to rotate the feeding shaft 2, and an outlet control unit to open or close an outlet 1a of the ice container 1 which is adjacent to the ice crusher 5. The outlet control unit includes a control member 7, a connection rod 8, and a solenoid drive unit 9. The control member 7 is rotatably installed at a position around the outlet 1a of the ice container 1. The connection rod 8 is rotatably mounted at a predetermined

position of the ice container 1 to operate the control member 7, and extends from a position around the outlet 1a to a position opposite to the outlet 1a in a horizontal direction. The solenoid drive unit 9 is provided at a rear portion of the ice container 1 to be adjacent to the drive motor 6, and functions to rotate the connection rod 8 at a predetermined range, thus operating the control member 7. As shown in FIG. 2, when a movable part 9a of the solenoid drive unit 9 reciprocates within a predetermined range, a first eccentric part 8a provided at a rear end of the connection rod 8 rotates in a predetermined range to rotate the connection rod 8. At this time, a second eccentric part 8b which is opposite to the first eccentric part 8a, operates the control member 7, thus opening or closing the outlet 1a of the ice container 1.

[0006] However, the conventional ice feeding unit has a problem that there may occur a clicking sound whenever the solenoid drive unit 9 is operated to actuate the control member 7, since the control member 7 is operated by the solenoid drive unit 9 which reciprocates by electricity. Thus, there may be noise due to interference between the movable part 9a of the solenoid drive unit 9 and the connection rod 8 when the movable part 9a of the solenoid drive unit 9 is operated.

SUMMARY OF THE INVENTION

[0007] Accordingly, it is an aspect of the present invention to provide a refrigerator with an ice feeding unit which allows an outlet control unit to open or close an outlet of an ice container without generating noise.

[0008] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0009] These and/or other aspects are achieved by providing a refrigerator comprising an ice feeding unit comprising an ice container, a control member, a connection rod, a rotary cam, and a motor. The ice container is provided in an ice storage compartment. The control member is installed at a position around an outlet of the ice container to open or close the outlet of the ice container. The connection rod is rotatably installed at a predetermined position of the ice container to operate the control member. A first eccentric part is provided at a first end of the connection rod which is in contact with the control member, to be eccentric from a center of

rotation of the connection rod, and a second eccentric part is provided at a second end of the connection rod which is opposite to the first end of the connection rod, to be eccentric from the center of rotation of the connection rod. The rotary cam is installed to be in contact with the second eccentric part of the connection rod, and rotates the second eccentric part of the connection rod at a predetermined angle. The motor drives the rotary cam.

[0010] The connection rod horizontally extends from a position around the outlet of the ice container to a position opposite to the outlet of the ice container. The connection rod is bent at the first and second ends thereof to form the first and second eccentric parts.

[0011] The rotary cam is a cylindrical shape having an inclined cam face formed at an end of the rotary cam to be in contact with the second eccentric part of the connection rod.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a perspective view of a conventional ice feeding unit for a refrigerator;

FIG. 2 is a perspective view of a solenoid drive unit included in the ice feeding unit of FIG. 1;

FIG. 3 is a sectional view showing an interior of a refrigerator with an ice feeding unit, according to an embodiment of the present invention;

FIG. 4 is a perspective view of the ice feeding unit included in the refrigerator of FIG. 3; and

FIG. 5 is a perspective view of a cam drive unit included in the ice feeding unit of FIG. 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0014] As shown in FIG. 3, a refrigerator according to an embodiment of the present invention includes a cabinet 10. A cooling compartment 11 is vertically defined in the cabinet 10, and is opened at a front thereof. A door 12 is mounted to the front of the cooling compartment 11 to open or close the front of the cooling compartment 11. An evaporator 13 is mounted to a rear portion of the cabinet 10 to generate cool air. A compressor 14 is mounted to a lower portion of the cabinet 10.

[0015] An automatic ice making unit 15 is mounted to an upper portion of the cooling compartment 11 to make ice cubes. An ice container 16 is provided under the automatic ice making unit 15 to contain the made ice cubes therein. Further, a plurality of shelves 17 and drawers 18 are installed in the cooling compartment 11 to store frozen food.

[0016] Further, an ice discharging path 19 is provided at a predetermined position of the door 12 to communicate with an interior of the cooling compartment 11, thus allowing a user to take the ice cubes from the ice container 16 without opening the door 12. An ice dispensing recess 20 is provided on a front surface of the door 12 so as to easily receive the ice cubes discharged through the ice discharging path 19. In the ice dispensing recess 20 are provided a switch 21 to open or close an outlet of the ice discharging path 19 and operate the ice feeding unit 30 installed in the cooling compartment 11, and a guide member 22 to prevent dispersion of the ice cubes discharged from the ice discharging path 19.

[0017] As shown in FIG. 4, the ice feeding unit 30 functions to feed the ice cubes from the ice container 16 to the ice discharging path 19. The ice feeding unit 30 includes a coiled feeding shaft 31 and a spiral blade 32. The feeding shaft 31 is rotatably installed in the ice container 16. An ice crusher 34 is installed at a position around an outlet 36 of the ice container 16 to finely crush the ice cubes. A drive motor 35 is mounted to a rear portion of the ice container 16 to rotate the feeding shaft 31, the spiral blade 32, and the ice crusher 34.

[0018] The feeding shaft 31, the spiral blade 32, and the ice crusher 34 are coaxially arranged in a row. When the drive motor 35 is operated, the feeding shaft 31 is rotated along with the spiral blade 32 and the ice crusher 34. The ice feeding unit 30 includes a guide cylinder 33. The guide cylinder 33 surrounds an outer circumference of the spiral blade 32 to push the ice cubes to the outlet 36 of the ice container 16. The ice crusher 34 includes a fixed cutter 34a which is fixed at a position around the outlet 36, and a rotatable cutter 34b which is

rotated along with the feeding shaft 31. Thus, when the rotatable cutter 34b is rotated, the ice cubes are held between the fixed and rotatable cutters 34a and 34b to be cut.

[0019] Referring to FIG. 4, the refrigerator according to the present invention comprises an outlet control unit 40 to open or close the outlet 36 of the ice container 16. According to an opening ratio of the outlet 36 which is controlled by the outlet control unit 40, ice cubes of large sizes or ice pieces of small sizes may be dispensed through the outlet 36. The outlet control unit 40 comprises a control member 41, a connection rod 42, and a cam drive unit 43. The control member 41 is rotatably mounted to a position around the outlet 36 of the ice container 16. The connection rod 42 is rotatably mounted along a side of the ice container 16 to operate the control member 41. The cam drive unit 43 is installed at a predetermined position of the rear portion of the ice container 16 so as to rotate the connection rod 42 in a predetermined rangeand to operate the control member 41.

[0020] The connection rod 42 is rotatably mounted to an outer surface of the ice container 16, and horizontally extends from a position around the outlet 36 of the ice container 16 to a position opposite to the outlet 36 of the ice container 16. The connection rod 36 is bent at opposite ends thereof to form first and second eccentric parts 42a and 42b which are eccentric from a center of rotation of the connection rod 36. This construction allows the cam drive unit 43 to rotate the second eccentric part 42b, thus resulting in a rotation of the connection rod 42. When the connection rod 42 is rotated, the first eccentric part 42a is rotated to rotate the control member 41, thus opening or closing the outlet 36 of the ice container 16.

[0021] Referring to FIG. 5, the cam drive unit 43 comprises a rotary cam 44, and a motor 45 to rotate the rotary cam 44. The rotary cam 44 has a cylindrical shape and has an inclined cam face 44a at an end thereof. The inclined cam face 44a is in contact with the second eccentric part 42b of the connection rod 42. When the rotary cam 44 is rotated by the motor 45, the second eccentric part 42b of the connection rod 42 which contacts the inclined cam face 44a of the rotary cam 44, is rotated while moving upward and downward along the inclined cam face 44a. Therefore, the connection rod 42 is smoothly operated without generating noise compared to the conventional solenoid drive unit.

[0022] The operation of the ice feeding unit included in the refrigerator constructed as described above will be described in the following.

[0023] When a user desires to obtain the ice cubes of a large size, the user manipulates the refrigerator so that the ice cubes of large sizes are selected, and thereafter the switch 21 provided in the ice dispensing recess 20 of the door 12 is manipulated. Then the drive motor 35 of the ice feeding unit 30 rotates the feeding shaft 31 and the spiral blade 32 which are provided in the ice container 16. By the operation, the ice cubes are discharged to the outlet 36 of the ice container 16. Since the outlet 36 of the ice container 16 which is controlled by the control member 41, is completely opened by the cam drive unit 43, the ice cubes are discharged to an outside of the ice container 16 while not being crushed. Since the outlet 36 is completely opened, the ice cubes are discharged through the outlet 36 while not being held between the rotatable cutter 34b and the fixed cutter 34a. Thus, the ice cubes are discharged to the ice discharging path 19 of the door 12 without being crushed.

[0024] However, when the user desires to obtain the ice pieces of a small size, the user manipulates the refrigerator so that the ice pieces are selected, and thereafter the switch 21 provided in the ice dispensing recess 20 of the door 12 is manipulated. The drive motor 35 operates and discharges the ice cubes from the ice container 16. Simultaneously, a portion of the outlet 36 of the ice container 16 is closed by the outlet control unit 40. Thus, the rotary cam 44 is operated by the motor 45 to rotate the connection rod 42. Further, the connection rod 42 rotates the control member 41 to close a part of the outlet 36. Then the ice cubes placed at the outlet 36 are guided to the fixed cutter 34a by the control member 41 which closes a portion of the outlet 36. Then the ice cubes are held between the fixed and rotatable cutters 34a and 34b to be crushed. The crushed ice pieces are discharged to the ice discharging path 19 of the door 12 through an open portion of the outlet 36. When such an operation is executed, the rotary cam 44 of the cam drive unit 43 is rotated while slowly moving the second eccentric part 42b of the connection rod 42 up and down. Thus, during operation of opening or closing the outlet 36, noise is not generated.

[0025] The present invention provides a refrigerator with an ice feeding unit which is designed such that a drive unit of an outlet control unit which opens or closes an outlet of an ice container comprises a cam drive unit having a rotary cam, thus allowing the outlet of the ice container to be quietly opened or closed.

[0026] Although an embodiment of the present invention has been shown and described, it would be appreciated by those skilled in the art that changes may be made in these

embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.